TECHNICAL SPECIFICATIONS

DIVISION 01 - GENERAL REQUIREMENTS

DIVISION 02 – EXISTING CONDITIONS

DIVISION 03 – CONCRETE

DIVISION 04 – MASONRY

DIVISION 05 - 30

DIVISION 31 – EARTHWORK

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SECTION 01 11 00

SUMMARY OF THE WORK

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections apply to this Section.

B. Examine all Drawings and all other sections of the Specifications for requirements therein affecting the work of this Section.

1.02 SUMMARY OF WORK

A. The scope of work of this project generally consists of the construction of an accessible ramp to provide access to an existing point of entrance/egress at an existing school building. The construction consists of removal of concrete stairs, landing, and handrails, and the construction of an accessible ramp with handrails and/or guardrails where indicated. The work includes excavation and earthwork, cast in place cement concrete, subgrade preparation, cement concrete paving, bituminous concrete pavement, installation of handrails, and all related incidental site work.

B. The work to be done under this Contract consists of provision and payment for all materials, labor, tools, equipment, pumping, water, light, heat, power, transportation, supervision, field engineering, testing, temporary construction, taxes, and all other services and facilities necessary to execute the work and to complete the project in every respect and as shown on the drawings and/or specified herein.

1.03 RELATED SECTIONS

A. Refer to the following related sections of work:

1. Section 01 14 13 – ACCESS TO SITE

1.04 DEFINITIONS

A. The following definitions apply to the project:

1. The School: The name given to the Bartlett Community Partnership School, at 79 Wannalancit Street in Lowell, Massachusetts.

2. The Project Area: A portion of land within the School campus adjacent to the point of access and egress where improvements are proposed, and consisting of bituminous concrete pavement, cement concrete steps, and an adjacent school playground.

3. Owner: Also referred to in the Contract Documents as “City” shall mean the City of Lowell, Massachusetts.

4. Owner’s Representative: Shall mean either the Owner’s Staff, or the Owner’s designated Project Manager.

5. Designer: Shall mean Greenman-Pedersen, Inc., 181 Ballardvale Street, Wilmington, MA 01887, or one of its authorized representatives. This may also be referred to in the Contract Documents as Engineer. The Contractor shall consult the Owner's Representative and/or Designer as needed or as specifically required by these specifications.

1.04 WORK BY OWNER

A. None

1.05 OWNER FURNISHED PRODUCTS

A. None

1.06 CONTRACTOR USE OF SITE

A. Refer to Section 01 14 13 – ACCESS TO SITE for access requirements.

1.07 FUTURE WORK

A. None

1.09 WORK SEQUENCE

A. Construct work in stages to accommodate Owner's requirements during the construction period, coordinate construction schedule and operations with Owner.

B. All work shall be accomplished by the finish date stipulated in the contract.

PART 2: PRODUCTS

(NOT USED)

PART 3: EXECUTION

(NOT USED)

END OF SECTION

SECTION 01 14 13

ACCESS TO SITE

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections apply to this Section.

B. Examine all Drawings and all other sections of the Specifications for requirements therein affecting the work of this Section.

1.02 SUMMARY OF WORK

A. The scope of work for this section includes:

1. Site entry and access protocols

2. Schedule of site access with updates.

B. Contractor shall minimize noise and dust impacts to adjacent uses and abutters.

C. The Contractor will coordinate access with the Owner.

1.03 RELATED SECTIONS

A. Refer to the following related sections of work:

1. Section 01 11 00 – SUMMARY OF THE WORK

1.04 GENERAL

A. The Owner retains the right to enter the construction limits to inspect and/or repair existing utilities, structures and property whenever necessary. Owner shall coordinate non-emergency access 24 hours in advance.

1.05 SITE ACCESS PROTOCOLS

A. The Contractor shall provide protocols and requirements for site access.

B. Contractor shall coordinate his schedule with Subcontractors as approved by Owner to ensure that facility operations are not significantly impacted.

1.06 EXISTING DRIVEWAY AND PARKING USE

A. The project area is located within and adjacent to a public facility and must accommodate access from adjacent properties throughout the course of the contract to the greatest extent feasible.

1.07 SUBMITTALS

A. Submit site access and safety protocols.

B. The Contractor shall prepare and submit for approval a projected schedule for site access over the life of the contract.

1. Update schedule components as needed.

PART 2: PRODUCTS

(NOT USED)

PART 3: EXECUTION

(NOT USED)

END OF SECTION

SECTION 01 40 00

QUALITY CONTROL

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections apply to this Section.

B. Examine all Drawings and all other sections of the Specifications for requirements therein affecting the work of this Section.

1.02 SUMMARY OF WORK

A. Refer to the General Conditions and Supplementary Conditions for general requirements, and technical specifications for specific testing requirements and methods.

B. Unless otherwise provided in the specifications, the Contractor or assigned subcontractor shall provide all materials, samples, mock-ups or assemblies for all tests specified in various sections of specifications, or as directed by the Designer, and pay shipping costs of such samples to laboratory or other testing location and facility. Unless specified otherwise, all tests shall be made by an approved independent testing laboratory and reports provided to Designer.

C. Tests shall be provided and accomplished in accordance with the standard used as the reference for the particular material or product, unless other test methods or criteria are specified. In the absence of a referenced standard, tests shall be accomplished in accordance with applicable ASTM Standards or Test Methods, current at the date of the Contract Document.

1.03 QUALIFICATIONS OF TESTING AGENCY

A. “Approved independent testing laboratory” shall mean an independent testing agency acceptable to the Owner and the Designer and possessing the professional qualifications and equipment to perform the specified tests and to evaluate and report the results.

1.04 QUALITY ASSURANCE

A. Comply with requirements of ASTM E29 and ASTM D3740.

B. Laboratory shall maintain a full-time registered Engineer on staff to review services.

C. Laboratory authorized to operate in State in which Project is located.

D. Testing equipment shall be calibrated at reasonable intervals with devices of accuracy traceable to either NBS Standards or accepted values of natural physical constants.

1.05 REFERENCES

A. ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

B. ASTM E29 - Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

1.06 PAYMENT FOR TESTS

A. The Contractor or assigned Subcontractor shall be responsible for, and shall pay for, all off-site and on-site tests as stipulated in these specifications, or as may be required by building code and/or best practices.

B. The General Contractor will pay for the following testing:

1. All soil compaction testing.

2. Concrete compressive strength.

C. The Owner's Representative and the Designer shall have the right to witness all off-site and on-site tests performed by the Contractor or assigned subcontractor and the Contractor shall furnish adequate notice of when tests will be made.

D. When in the opinion of the Designer, additional tests or inspections are required because of the manner in which the Contractor executes its work, such tests and inspections shall be paid for by the Owner but will be deducted from the contract price. Examples of such tests and inspections are:

1. Tests of materials substituted for previously accepted materials, or substitute for specified materials; retests made necessary by failure of materials to comply with the requirements of the specifications; tests made necessary because of portions of the work not fully meeting specifications or plan requirements, etc.

1.07 TESTS TO DEMONSTRATE QUALIFICATION

A. In addition to tests specified, should the Contractor propose a product, material, method of assembly that is of unknown or questionable quality to the Designer, the Designer may require and order suitable tests to establish a basis for acceptance or rejection. Such tests will be paid for by the Contractor, or by the Subcontractor requesting approval. "Standard" test reports on "similar" material will not be acceptable.

B. The Owner and Designer reserve the right to require certification or other proof that the material, assembly, equipment, system or other product furnished or proposed to be furnished, for this Project is in compliance with any test or standard called for. The certificate shall be signed by a representative of the independent testing laboratory.

C. Any tests required to qualify the Contractor or any of his workmen for any phase of the work, and any test of a method, system or equipment that may be required by specification or law to qualify the item for use, shall be made or taken without additional reimbursement.

D. If exploratory work is required to determine the cause of defects, the cost of such work shall be borne by the Contractor or assigned subcontractor responsible for such work if the work is found, in the judgment of the Designer to be defective. If the Contractor or

assigned subcontractor responsible for the work is adjudged by the Designer to be not at fault, exploratory testing will be paid by the Owner.

1.08 INSPECTIONS

A. Should the specifications, Designer's instructions, laws, ordinances or any public authority require any work to be inspected or approved, the Contractor shall give timely notice of its readiness for inspection and a reasonable date fixed for such inspection. If any work requiring inspection should be covered up without approval or consent of the approving agency, it must be uncovered for examination at Contractor's expense.

1.09 CERTIFICATES

A. Except for test reports provided and signed by approved independent testing laboratories, all certificates required by the specification shall be signed by an authorized official of the firm providing the certificate, with the signature notarized, when such certificates by the producer are acceptable to the Designer.

1.10 RETEST RESPONSIBILITY

A. Where results of required inspections, tests or similar prove unsatisfactory and do not indicate compliance of related work with requirements of the contract documents, then retests are the responsibility of the Contractor or assigned subcontractor, regardless of whether original test was Contractor's responsibility. Retesting of work revised or replaced by Contractor is Contractor's responsibility, where required tests were performed on original work.

B. Owner's decision on unsatisfactory testing resulting or retesting of work based on consultation with Testing Laboratory and Owner's Representative is final.

PART 2: PRODUCTS

(NOT USED)

PART 3: EXECUTION

(NOT USED)

END OF SECTION

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SECTION 01 56 16

DUST CONTROL

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections apply to this Section.

B. Examine all Drawings and all other sections of the Specifications for requirements therein affecting the work of this Section.

1.02 SUMMARY OF WORK

A. This section of the specification covers the control of dust via water or an approved soil stabilizer, complete in place.

B. The Contractor shall be required to provide dust control during all phases of the work.

1.03 ENVIRONMENTAL COMPLIANCE

A. Neither oil nor sodium chloride shall be used during or after construction for the control of dust or snow and ice.

PART 2: PRODUCTS

2.01 WATER

A. Water shall not be brackish and shall be free from oil, acid, and injurious alkali or vegetable matter.

2.02 SOIL STABLIZER

A. While water is preferred, if necessary a soil stabilizer such as $Soil_2O$ from Geltech or equal may be used. The product must be compatible with turf grass.

B. Magnesium Chloride, Calcium Chloride, Sodium Chloride or oil shall NOT be used nor shall mulch applications be acceptable.

PART 3: EXECUTION

3.01 APPLICATION

A. Water may be sprinkler applied with equipment including a tank with gauge-equipped pressure pump and a nozzle-equipped spray bar. Water shall be dispersed through the nozzle under a minimum pressure of 20 pounds per square inch, gauge pressure.

B. $Soil_2O$ shall be applied when ordered by the Designer and only in areas which will not be adversely affected by the application. Apply at rates recommended by the manufacturer.

END OF SECTION

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SECTION 02 41 13

SELECTIVE DEMOLITION

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections apply to this Section.

B. Examine all Drawings and all other sections of the Specifications for requirements therein affecting the work of this Section.

1.02 SUMMARY OF WORK

A. This Section includes the following:

1. Saw cutting of pavement.

2. Demolition and removal of selected site elements.

3. Removal and salvage of selected site elements.

1.03 RELATED SECTIONS

A. Examine all other Sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.

1.04 DEFINITIONS

A. Remove and Dispose (R&D): Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reset.

B. Remove and Salvage (R&S): Detach items from existing construction and deliver them to Owner ready for reuse.

C. Existing to Retain (RET): Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.05 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.06 SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.

B. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

1.07 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI A10.6 and NFPA 241.

1.08 PROJECT CONDITIONS

A. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

1. Do not close or obstruct walkways, parking stalls, driveways, or other occupied or used facilities without written permission from authorities having jurisdiction.

B. Owner assumes no responsibility for condition of areas to be selectively demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

2. Before selective demolition, Owner will remove the following items:

a. No items identified.

C. Storage or sale of removed items or materials on-site will not be permitted.

D. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

PART 2: PRODUCTS

Not Applicable

PART 3: EXECUTION

3.01 EXAMINATION

A. Review existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

B. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

C. When unanticipated conditions that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Owner’s Representative.

3.02 UTILITY SERVICES

A. Existing Utilities: Maintain adjacent services and protect them against damage during selective demolition operations.

B. Do not interrupt existing utilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.

1. Provide at least seventy-two (72) hours' notice to Owner if shutdown of service is required during changeover.

3.03 PREPARATION

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

2. Erect temporary protection, such as walks, fences, and railings where required by authorities having jurisdiction.

3. Protect existing site improvements, appurtenances, and landscaping to remain.

3.04 EXPLOSIVES

A. Explosives: Use of explosives will not be permitted.

3.05 POLLUTION CONTROLS

A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.

1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

2. Refer to Section 01 56 16 – DUST CONTROL.

B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

3.06 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations.

B. Removed and Salvaged Items: Comply with the following:

1. Clean salvaged items.

2. Pack or crate items after cleaning. Identify contents of containers.

3. Store items in a secure area until delivery to Owner. Transport items to Owner's storage area designated by Owner.

4. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items: Comply with the following:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment if necessary.

2. Store items in a secure area until reuse.

3. Protect items from damage during transport and/or storage.

4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Designer, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.07 PAVEMENT SAWCUTTING

A. Sawcutting of asphalt will be done in accordance to Subsection 482 of the Commonwealth of Massachusetts Department of Transportation Standard Specifications for Highways and Bridge, latest edition.

B. Provide sawcutting where shown on the plans or as directed.

3.08 PATCHING AND REPAIRS

A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.

B. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

C. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

3.09 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

B. Burning: Do not burn demolished materials.

3.10 SELECTIVE DEMOLITION SCHEDULE

A. Existing Construction to Be Removed:

1. Sawcut, strip, remove and dispose of bituminous pavement where shown or required**.**

B. Existing Items to Be Removed and Salvaged:

1. 4 Benches, Trash Receptacles as required

D. Existing Items to Remain:

1. All existing construction and items not specifically indicated on plans or directed by Designer to be removed including, but not limited to the following:

a. All pavement not specifically identified for removal.

b. All curbing not specifically identified for removal.

c. All fencing, gates, and retaining walls not scheduled for removal.

d. All site furnishings including benches, trash receptacles, and playground equipment.

e. All drainage and sewer pipes.

f. All trees, shrubs, and groundcovers.

END OF SECTION

SECTION 03 10 00

CONCRETE FORMWORK AND ACCESSORIES

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections apply to this Section.

B. Examine all Drawings and all other sections of the Specifications for requirements therein affecting the work of this Section.

1.02 SUMMARY OF WORK

A. Formwork, complete with required shoring, bracing, and anchorage.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Refer to following related sections:

1. Section 03 20 00 – CONCRETE REINFORCEMENT

2. Section 03 30 00 – CAST IN PLACE CONCRETE

1.04 QUALITY ASSURANCE:

A. Design Criteria: Conform to ACI 347-68, Chapter I.

B. Allowable Tolerances: Conform to ACI 347-68, 2.4.

1.05 STORAGE OF MATERIALS:

A. Store materials on and under protective sheeting.

1.06 COORDINATION:

A. Notify responsible trades of schedules of concrete pours to allow time for installation and coordination.

PART 2: PRODUCTS

2.01 MATERIALS:

A. Forms:

1. Flatwork: Nominal 2" thick No. 2 Common Southern Yellow Pine or steel forms.

2. Vertical and Custom Work: Exterior grade Standard Douglas Fir (or equal plywood), minimum three ply, one smooth side sufficiently thick to sustain loads, or steel forms.

B. Form Oil: Non staining, paraffin-base oil having a specific gravity of between 0.8 and 0.9.

C. Form Ties: Bolts, rods, or patented devices having tensile strength of 3000 lbs., adjustable length, free of lugs which would leave a hole larger than 5/8" diameter and having a full one-inch depth of break-back.

PART 3: EXECUTION

3.01 CONSTRUCTION AND ERECTION:

A. Construct forms in accordance with ACI 347-68.

B. Build forms to shapes, lines and dimensions of detailed members of concrete construction. Set to line and grade, brace and secure to withstand placing of concrete and maintain their shape and position.

C. Construct forms with care to produce concrete surfaces without unsightly or objectionable form marks in exposed concrete surfaces.

D. Thoroughly clean surfaces of form material and remove nails before reuse. Do not reuse damaged or worn forms. Coat contact surfaces of forms with non-staining form oil prior to placing metal reinforcement.

E. Immediately before placing concrete, clean forms of chips, sawdust, and debris. Immediately after removal of forms, remove form ties, wires, and defects and patch.

3.02 INSERTS AND ACCESSORIES:

A. Make provisions for required installation of accessories, bolts, hangers, sleeves, anchor slots and inserts cast in concrete. Obtain suitable templates or instructions for installation of items. Place expansion joints where detailed and required.

3.03 REMOVAL OF FORMS AND SHORING:

A. Remove forms and shores in accordance with ACI 347-68.

3.04 CLEANUP:

A. Remove debris and trash.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCEMENT

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections apply to this Section.

B. Examine all Drawings and all other sections of the Specifications for requirements therein affecting the work of this Section.

1.02 SUMMARY OF WORK

A. Concrete reinforcing, complete with required supports, spacers, and related accessories.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. Refer to the following related sections:

1. Section 03 10 00- CONCRETE FORMWORK AND ACCESSORIES

2. Section 03 30 00- CAST IN PLACE CONCRETE

1.04 DELIVERY AND STORAGE:

A. Stack reinforcing steel in tiers. Mark each length, size, shape and location. Maintain reinforcement free of dirt, mud, paint or rust.

1.05 REFERENCE STANDARDS:

A. American Concrete Institute (ACI):

1. ACI 315-80, Manual of Standard Practice for Detailing Reinforced Concrete Structures.

2. ACI 318-77, Building Code Requirements for Reinforced Concrete.

B. American Society for Testing and Materials (ASTM - latest editions):

1. ASTM A233, Mild Steel Arc Welding Electrodes.

2. ASTM A615, Deformed Billet-Steel Bars for Concrete Reinforcement.

3. ASTM A706, Low-Alloy Steel Deformed Bars for Concrete Reinforcement.

C. Concrete Reinforcing Steel Institute (CRSI): Manual of Standard Practice, latest edition.

D. American Welding Society (AWS): Reinforcing Steel Welding Code, D12.1-75, including latest revisions.

1.06 SUBMITTALS:

A. Shop Drawings: Indicate complete reinforcing method for each reinforcement type including materials, dimensions, and placing details not shown on drawings.

PART 2: PRODUCTS

2.01 MATERIALS:

A. Steel Reinforcement: Deformed billet steel, ASTM A615, Grade 60. Minimum 75% Recycled Product.

2.02 FABRICATION:

A. Fabricate to sizes, shapes, and lengths detailed in accordance with requirements of ACI 318-71 and ACI 315-65.

PART 3: EXECUTION

3.01 INSTALLATION:

A. Accurately place reinforcing steel in accordance with drawings. Thoroughly clean reinforcement of any coating which would reduce bonding. Do not heat, cut, or bend bars without Designer's approval.

3.03 CLEANUP:

A. Remove debris and trash resulting from specified work.

END OF SECTION

SECTION 03 30 00

CAST IN PLACE CONCRETE

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections apply to this Section.

B. Examine all Drawings and all other sections of the Specifications for requirements therein affecting the work of this Section.

1.02 SUMMARY OF WORK

A. Formwork, complete with required shoring, bracing, and anchorage.

B. Concrete reinforcing, complete with required supports, spacers, and related accessories.

C. Cast-in-place concrete including all footings and foundations.

1.03 RELATED WORK

A. Related sections include:

1. Section 03 10 00 – CONCRETE FORMWORK AND ACCESSORIES
2. Section 03 20 00 – CONCRETE REINFORCEMENT
3. Section 31 20 00 – EARTHWORK
4. Section 32 13 00 – CEMENT CONCRETE PAVING

1.04 QUALITY ASSURANCE

A. Perform cast-in-place concrete work in accordance with ACI 301, unless specified otherwise in this project.

B. Keep copy of ACI 301 in field office for duration of project.

1.05 TESTING LABORATORY SERVICES

A. Inspection and testing of concrete mix will be performed in accordance with Section 01 40 00 – QUALITY CONTROL.

B. Provide free access to work and cooperation with testing firm.

C. Submit proposed concrete mix design to Designer for review prior to commencement of work.

D. Three concrete test cylinders will be taken for every 75 or less cubic yards concrete placed.

E. One additional test cylinder will be taken during cold weather concreting and be cured on job site under same conditions as concrete it represents.

F. One slump test will be taken for each set of test cylinders taken.

1.06 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings.

1.07 SUBMITTALS

A. Submit product data and shop drawings of reinforcing steel in accordance with Section 01 33 00 – SUBMITTAL PROCEDURES.

B. Indicate bar size, spacing, locations and quantities of reinforcing steel and wire fabric, bending and cutting schedules, and supporting and spacing devices.

C. Indicate pertinent formwork dimensioning, methods of construction, materials, arrangement of joints, ties and shores, location of bracing and temporary supports, schedule of erection and stripping.

D. Prepare shop drawings under seal of Professional Structural Engineer registered in Commonwealth of Massachusetts.

E. Submit product data and test results in accordance with these Specifications.

PART 2: PRODUCTS

2.01 CEMENT

A. The following table of minimum cement contents for various minimum 28 days compressive strengths (6"x12" cylinder) are based on air entrained and water reduced mixtures. The use of an approved additive other than air entraining and water reducing additives shall not affect the minimum cement content.

B. The Contractor shall submit to the Designer, for approval his proposed concrete supplier, source and type of materials, with current ASTM C-33 aggregate data, and concrete mix designs by an approved laboratory complete with trial mix data. Trial mixtures will be designed and tested at the maximum allowable slump and air content for each designated class of concrete.

Minimum 28 day Compressive Strength	Minimum Cement Pounds/Cu. Yd. Max. Size C.A. Inches			In Place Slump Inches
Lbs./Sq.In.	1 ½	3/4	3/8	
2000	376	423	470	3-5
2500	423	470	517	3-5
3000	470	517	564	3-5
3500	517	564	611	3-5
4000	564	611	658	3-5

4500	611	658	705	3-5
5000	658	705	752	3-5

Air Content

% ± 1	5.0	6.0	7.5

All scored concrete pavement for sidewalks shall have a minimum compressive strength of 4000 psi and contain 6% ± 1% entrained air.

All concrete which will be subjected to conditions of severe exposure will be 4000 psi with air-entrained content of 7% ± 1.5%.

B. MATERIALS

Portland Cement Shall conform to ASTM C150, latest edition.

Portland cement used for concrete shall be the type designed on the plans and/or in the specifications for the particular work. If no type is specified, Type II shall be furnished.

When high early strength is required, it shall be attained by using Type III cement or by adding 15% additional Type II cement.

C. FINE AGGREGATE

Fine aggregate shall consist of natural sand, manufactured sand or a combination thereof, conforming to the requirements of ASTM C33, Specification for "Concrete Aggregates", latest edition. The Fineness Modulas of the fine aggregate shall be 2.80 + .20 and the percent passing the #200 sieve shall not exceed 2 percent by dry sieving and 3 percent by wet sieving.

D. COARSE AGGREGATE

Coarse aggregate of washed gravel, crushed gravel, crushed stone or a combination thereof conforming to ASTM C33 Specification for "Concrete Aggregates", latest edition. Aggregate for Lightweight Concrete shall conform to ASTM C330 Specification for "Lightweight Aggregates for Structural Concrete".

E. WATER

Water for concrete shall be clear and apparently clean and shall not exhibit any deleterious effects upon the required concrete properties.

F. ADMIXTURES

Air entraining and water reducing admixtures will be used in all concrete as specified. They shall be used in strict accordance with the manufacturer's recommendations and added at the batch plant. Admixtures shall be a ready-to-use liquid material and contain no calcium chloride. Superplasticizers may be added at the plant or job site.

G. AIR ENTRAINING ADMIXTURE

Shall conform to ASTM C260 Specification for "Air Entraining Admixtures for Concrete".

H. WATER REDUCING ADMIXTURE

Shall conform to ASTM C494 Specification for "Chemical Admixtures for Concrete".

2.02 GROUT

A. Refer to Section 04 05 13 – MORTAR AND GROUT.

PART 3: EXECUTION

3.01 GENERAL

A. Install concrete work in accordance with ACI 301 except as amended by this Section.

3.02 FORMWORK (ACI 301 4.2)

A. Formwork shall be in accordance to Section 03 10 00.

B. Obtain Designer's review for use of earth forms. When using earth forms, hand-trim sides and bottoms, and remove loose dirt prior to placing concrete.

B. No concrete shall be poured until Designer has inspected formwork.

3.03 TOLERANCES (ACI 301 4.3)

3.04 PREPARATION OF FORM SURFACES (ACI 301 4.4)

A. Apply form release agent on formwork in accordance with manufacturer's recommendations. Apply prior to placing reinforcing steel, anchoring devices and embedded parts. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings which are affected by agent.

3.05 FINISHING FORMED SURFACES (ACI 301 10)

A. Formed Surface Finishes: ACI 301 10.4 Provide smooth rubbed finish at concrete columns, walls, steps and curb edges.

3.06 CONNECTIONS TO EXISTING WORK

A. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solidly with non-shrink grout.

B. Prepare previously placed concrete by cleaning with steel brush and apply bonding agent. Apply bonding agent in accordance with manufacturer's recommendations.

3.07 REPAIR OF SURFACE DEFECTS (ACI 201 9)

A. Allow Designer to inspect concrete surfaces immediately upon removal of forms.

B. Modify or replace concrete not conforming to required lines, detail, and elevations.

B. Repair or replace concrete not properly placed resulting in excessive honeycombing and

other defects. Do not patch, repair or replace exposed architectural concrete except upon direction of Designer.

END OF SECTION

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SECTION 04 05 13

MORTAR AND GROUT

PART 1: GENERAL

1.01 WORK INCLUDED

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections apply to this Section.

B. Examine all Drawings and all other sections of the Specifications for requirements therein affecting the work of this Section.

1.02 SUMMARY OF WORK

A. The Contractor shall furnish and install grout as required for various items of the work.

B. Refer to specific sections for requirements.

1.03 RELATED SECTIONS

A. Related Sections include the following:

1. Section 03 30 00 – CAST IN PLACE CONCRETE

1.04 QUALITY CONTROL

A. Source Limitations for Mortar and Grout Materials: Obtain mortar ingredients of uniform quality for each cementitious component from a single manufacturer and each aggregate from one source or producer.

PART 2: PRODUCTS

2.01 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150, Type II

B. Blended Hydraulic Cement: ASTM C595, Type IS or IP

C. Masonry Cement: ASTM C91

C. Mortar Cement: ASTM C1329, Type N, S or M.

D. Hydrated Lime: ASTM C207, Type S

E. Quicklime for Structural Purposes: ASTM C5

F. Aggregate for Masonry Mortar: ASTM C144

G. Aggregate for Masonry Grout: ASTM C404, gradation as follows:

1. Fine aggregate: Size No. 1

2. Coarse aggregate: Size No. 8

H. Water: Potable and free of contaminants deleterious to the mortar or grout.

I. Admixtures: Use only as approved by the Designer.

J. Pigmentation: For job site pigmented mortar, use mineral pigments and, with the exception of carbon black, limit pigments to 10 percent by weight of cement content. Limit water soluble materials to one percent by weight of cement content, and carbon black to 1.5 percent by weight of cement content. Where masonry cement is used, limit pigmentation to one-half the specified limits.

K. Do not use waterproofing additives in mortar without the written approval of the Engineer.

L. Do not use anti-freeze compounds in mortar.

2.02 MORTAR MIXES

A. Unreinforced Masonry Mortar: ASTM C270 or ASTM C387, type as follows:

1. Below grade, Type M.

2. Exterior reinforced masonry, Type S.

3. For exterior, above-grade, load-bearing and non-load-bearing walls, veneer walls, and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.

B. Reinforced Masonry Mortar: ASTM C270, Type M; ASTM C387, Type M; or C476.

C. High-strength Mortar: ASTM C387.

D. For masonry which will remain exposed to view in the finished work, and for any masonry to receive paint or other applied coatings, provide factory-packaged, non-staining mixes meeting the requirements specified above and containing no un-hydrated lime, nor slag.

E. The use of calcium chloride in mortar mixes is prohibited.

2.03 GROUT MIXES

A. General: ASTM C476.

B. Compressive Strength: 2000 minimum per ASTM C42 at 28 days.

PART 3: EXECUTION

3.01 MIXING MORTAR

A. Measure materials by methods that will control and maintain the specified proportions during the entire progress of the work. Measure mortar materials by volume or equivalent weight. Do not measure by shovel. Measure sand in a damp loose condition.

B. Mix mortar for at least three minutes in an approved clean mechanical mixer. Mix mortar with the minimum amount of water consistent with good workability on the board, to provide maximum tensile bond strength within capacity of the mortar.

C. Use mortar within one hour after initial mixing. Do not re-temper mortar.

D. For alteration and restoration work, tint or middy the mix to match mortar of existing masonry.

END OF SECTION

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SECTION 05 52 00

METAIL RAILINGS

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections apply to this Section.

B. Examine all Drawings and all other sections of the Specifications for requirements therein affecting the work of this Section.

1.02 SUMMARY OF WORK

A. This work shall include furnishing and installing painted galvanized railings and components.

B. Work under this item shall include furnishing and installing welded steel hand railing fabricated with hot-rolled carbon steel handrail mouldings and channels, malleable iron fittings, and forged steel posts, as shown on the drawings or as directed by the Designer.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) Publications:

1. ASTM A36 - Structural Steel.

2. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

3. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

4. ASTM A1264 - Safety Requirements for Workplace Floor and Wall Openings, Stairs, and Railing Systems.

5. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

6. ASTM D822 - Tests on Paint and Related Coatings Using Filtered Open-Flame Carbon-Arc Exposure Apparatus.

7. ASTM D1794 - Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

8. ASTM D3363 - Test Method for Film Hardness by Pencil Test.

9. ASTM E894 - Anchorage of Permanent Metal Railing Systems and Rails for Buildings.

10. ASTM E935 - Permanent Metal Railing Systems and Rails for Buildings.

1.04 DESIGN REQUIREMENTS

A. Railing assemblies and attachments shall be designed, fabricated, and installed in accordance with ASTM A1264, ASTM E894, ASTM E935 to support:

1. 200 pounds concentrated loading applied at any point in any direction.

2. 50 pounds per linear foot uniform load applied horizontally to top of rail.

1.05 PROJECT CONDITIONS

A. Field Measurements: Where handrails and railings are indicated to fit to other construction, check actual dimensions of other construction by accurate field measurements before fabrication; show recorded measurements on final shop drawings.

B. Where field measurements cannot be made without delaying the railing fabrication and delivery, obtain guaranteed dimensions in writing by the Contractor and proceed with fabrication of products to not delay fabrication, delivery and installation.

C. Coordinate fabrication and delivery schedule of handrails with construction progress and sequence to avoid delay of railing installation.

1.06 SUBMITTALS

A. Manufacturer to submit approval drawings to include the following:

1. Section-thru details.

2. Mounting methods.

3. Typical Elevations.

4. Key plan layouts

5. Shop Drawings: Drawings showing fabrication and installation of handrails including plans, elevations, sections, details of components, anchor details, and attachment to adjoining units of work.

6. Tnemec specifications and color swatches.

1.07 WARRANTY

A. 10-year warranty for factory finish against cracking, peeling, and blistering under normal use.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Materials to be delivered to the job site in good condition and adequately protected against damage as handrails are a finished product.

B. Store on site in a location and manner to avoid damage. Stacking should be done in a manner that will prevent bending.

C. Store material in a clean, dry location away from uncured concrete and masonry. Any

protection on the railings during transportation should remain until installed.

PART 2: PRODUCTS

2.01 MATERIALS

A. All galvanized tube to be of the sizes indicated on the plans.

B. Bevel all Square edges and all exposed edges ground smooth and brushed finished.

C. Grip rail max. O.D. to meet all applicable Life safety and ADAAG Codes

D. Stainless steel set screws and hardware.

2.02 FINISHES

A. Smooth galvanized pipe and channels.

B. Tnemec metal paint finish.

2.03 FASTENERS

A. All mechanical fasteners used shall be manufactured from stainless steel 316.

2.04 FABRICATION

A. All mitered and welded corners and turned segments shall be ground smooth.

B. Make exposed joints butt tight and flush.

C. Interior sleeves shall be used for typical splices.

D. All ends to be capped and welded flush and ground smooth and brushed.

E. Verify dimensions on site prior to shop fabrication.

F. Complete exterior paint finishes in accordance with Tnemec Paint manufacturers specifications

G. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, and water reducing and plasticizing additives.

H. Fasteners: Stainless steel bolts and screws of type, size, and spacing as recommended by handrail manufacturer for specific condition.

2.05 FACTORY FINISH

A. Steel railing, posts, and other components shall be hot-dip galvanized to 1.25 ounces per square foot minimum zinc coating in accordance with ASTM A123. Components shall receive Tnemec metal paint finish.

B. Direct impact resistance tested in accordance with ASTM D2794: Withstand 160 inch-pounds.

C. Salt spray resistance tested in accordance with ASTM B117: No undercutting, rusting, or blistering after 500 hours in 5 percent salt spray at 95 degrees F and 95 percent relative humidity and after 1000 hours less than 3/16 inch undercutting.

D. Weatherability tested in accordance with ASTM D822: No film failure and 88 percent gloss retention after 1 year exposure in South Florida with test panels tilted at 45 degrees.

E. Color:

1. Color to be selected by Owner. Color swatch to be approved by Owner from standard colors.

PART 3: EXECUTION

3.01 FIELD VERIFICATION

A. Clean debris and dust from surfaces and embed holes thoroughly prior to installation.

1. Prepare surfaces using the methods recommended by the manufacturer for achieving proper results given the substrate and project conditions.

3.02 INSTALLATION

A. Install in accordance with manufacturer's drawings and directions to configurations indicated on Drawings and approved shop drawings.

B. Install posts plumb and level before grouting.

C. Do not install bent, bowed, or otherwise damaged rails or posts and remove damaged components from site and replace.

D. Any field welding shall be performed by a certified welder.

E. Touch-up damaged finish with paint supplied by manufacturer and matching original coating.

F. Fit exposed connections accurately together to form tight joints except as necessary for expansion.

G. Perform cutting, drilling, and fitting required for installation of handrails. Accurately set handrails in location, alignment, and elevation, measured from established lines and levels.

H. Set posts plumb within a tolerance of 1/16 inch.

3.03 PROTECTION

A. Upon delivery railing may have protective wrapping. At completion of railing installation, immediately remove any protective wrapping and clean all work for inspection and approval.

B. After installation, General Contractor or Owner shall be responsible for protection of railings during the balance of construction.

END OF SECTION

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SECTION 31 20 00

EARTHWORK

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections apply to this Section.

A. Examine all Drawings and all other sections of the Specifications for requirements therein affecting the work of this Section.

1.02 SUMMARY OF WORK

A. The work to be done under this Section consists of furnishing all materials, labor, tools and equipment, and performing all operations necessary to complete excavation of all types of material encountered, including placing of excavated material in backfill, disposal of unsuitable and/or surplus material, furnishing and placing borrowed materials; all as shown on the Drawings or necessitated by conditions encountered in the course of the work.

B. No earthwork operations shall start until the Contractor's plan for preventing silting and erosion for all phases of construction has been installed and approved.

B. The work includes, but is not limited to, the following items:

1. Excavating, filling, and backfilling for the construction of walls, pavements, and site improvements. Provide all additional fill materials as required and specified herein.

2. Removal and disposal of surplus and/or unsuitable materials.

3. Provide graded materials, as specified, for fills, base courses and backfills as required.

4. Perform all compaction of all fill materials as hereinafter specified.

5. Furnishing, placing, and compacting common borrow, gravel borrow, and crushed stone.

6. Excavation below grade on the drawings when necessitated by type of unsuitable material encountered, as ordered by the Designer.

7. Site grading, rough grading, fine grading.

8. Furnishing, placing and compacting any supplemental material as required to bring the excavated area to grade as shown on the contract drawings due to the removal of unsuitable backfill material.

9. Provide Dust control.

10. Provide Erosion and Sedimentation control as required.

11. Pumping or other dewatering procedures necessary to maintain excavated spaces free from water from any source.

12. Obtain all required permits, licenses and approvals of appropriate municipal and utility authorities prior to commencing work of this Section and pay all costs incurred therefrom.

C. The General contractor is required to exercise extreme care in relation to excavation activities within the proximity of existing drainage and utilities. Excavation close to adjacent structures shall be done by hand.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Examine all other Sections of the Specifications and all Drawings for relationship of the work under this Section and work of other trades.

1 Section 01 56 16 – DUST CONTROL

2 Section 03 10 00 – CONCRETE FORMWORK AND ACCESSORIES

3 Section 31 23 19 – CONTROL OF WATER

1.04 STANDARDS

A. The following standards form a part of these Specifications:

1. ASTM D 1557. Test for Moisture Density of Soils and Soil-Aggregate Mixtures.

2. ASTM D 1556. Test for Density of Soil and Soil Aggregate in Place by the Sand-Cone Method.

1.05 ENVIRONMENTAL COMPLIANCE

A. All fill and/or mulch incorporated into the site must be clean, debris free and devoid of invasive plants or their parts or seeds.

B. Fill shall contain no trash, refuse, rubbish, or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.

C. The following shall also be prohibited: chemically contaminated material; concrete and asphalt rubble; stumps and other solid waste.

1.06 LAWS, ORDINANCES, PERMITS AND FEES

A. Give necessary notices, obtain all permits and pay all governmental taxes, fees and other costs in connection with this work, file all necessary plans, prepare documents and obtain all necessary approvals.

B. Obtain all required certificates of inspection for this work and deliver same to the Owner before request for acceptance and final payment for the work.

C. Include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings (in addition to contract drawings and documents) in order to comply with all applicable laws, ordinances, rules and regulations of the Commonwealth of Massachusetts, whether or not shown on the Drawings and/or specified.

D. The Contractor shall provide a temporary sidewalk or a detour whenever a sidewalk is closed because of the construction. The Contractor shall so conduct his operations as to interfere as little as possible with use ordinarily made to roads, driveways, alleys, sidewalks, or other facilities near enough to the work to be affected thereby.

1.07 SCHEDULING

A. The Contractor shall submit to the Designer, for approval by the Owner, a progress schedule as specified in Section 01 33 00 – SUBMITTAL PROCEDURES.

1.08 DEFINITIONS

A. The following related items are included herein and shall mean:

1. Standard Specifications: The Commonwealth of Massachusetts, Department of Transportation (MassDOT), Standard Specifications for Highways and Bridges, latest edition.

2. ASTM: American Society of Testing and Materials.

3. AASHTO: American Society of State Highway and Transportation Officials.

4. Standards for Specifications for Soil Erosion and Sediment Control in Developing Areas: Published by the Soil Conservation Services, U.S. Department of Agriculture, College Park, Maryland.

1.09 EXAMINATION OF CONDITIONS

A. The Contractor shall fully inform themselves of existing conditions of the site before submitting his bid and shall be fully responsible for carrying out all site work required to fully and properly execute the work of the Contract, regardless of the conditions encountered (even if the actual conditions are inconsistent with those assumed).

B. Plans, surveys, measurements, and dimensions under which the work is to be performed are believed to be correct to the best of the Designer knowledge, but the Contractor shall have examined them for them self during the bidding period, as no allowance will be made for any errors or inaccuracies that may be found therein.

1.10 SUBSURFACE INFORMATION

A. The Owner assumes no responsibility for the Contractor’s failure to make his own investigation and makes no representation regarding the character of the soil or subsurface conditions which may be encountered during the performances of the work.

1.11 BENCHMARKS, SURVEY AND LAYOUT WORK

A. Lines and grade work in accordance with Drawings and Specifications shall be laid out by a registered Civil Engineer or Land Surveyor employed by the Contractor. The Contractor shall establish permanent benchmarks, to which access can easily be had during the progress of the work. The Contractor shall maintain all established bounds and

benchmarks and replace, as directed, any which may be disturbed or destroyed.

The selection of the registered Engineer or Surveyor shall be approved by the Designer.

B. The Contractor shall submit written confirmation of dimensions and elevations on the ground and report any discrepancies immediately to the Designer. Such confirmation shall bear the Surveyor's stamp. Any discrepancies not reported prior to construction shall not be the basis of claims for extra compensation.

C. The Contractor shall not commence any excavation or construction work, until the Surveyor's/Engineer's verification has been received and approved by the Owner.

1.12 FINISHED GRADES

A. The words "finished grades" as used herein mean the required final grade elevations indicated on the Drawings. Where not otherwise indicated, site areas shall be given uniform slopes between the points, for which finished grades are shown, or between such points and existing grade except that vertical curves or rounding shall be provided at abrupt changes in slope.

1.13 GRADES AND ELEVATIONS

A. The Drawings indicate, in general, the alignment and finished grade elevations. The Designer however, may make such adjustments in grades and alignment as are found necessary to avoid interference and to adapt the grading to other special conditions encountered.

B. Spot grades shall govern over proposed contours.

1.14 WORK IN THE PUBLIC WAYS

A. Conduct earthwork operations to ensure minimum interference with streets, walks, and other adjacent facilities. Do not close or obstruct street, walks, etc. without written permission from authorities having jurisdiction. Provide barricades, fences, signs and all other safety devices required for the protection of the public.

B. Notify the appropriate municipal officials at least seven calendar days in advance of commencing any work in the public ways to obtain all required permission to perform the work. Perform all work in the public ways in a manner required by the municipal authorities.

1.15 DISPOSITION OF EXISTING UTILITIES

A. Locate and mark underground utilities to remain in service before beginning the work. Do not interrupt existing utility service except as authorized in writing by authorities having jurisdiction.

B. Active utility lines on the site shall be carefully protected from damage and relocated or removed as required by the work. When an active utility line is exposed during construction, its location and elevation shall be plotted on the Record Drawings and both the Designer and the Utility Owner notified in writing.

C. Inactive or abandoned utilities encountered during construction operations shall be removed, plugged or capped. The location of such utilities shall be noted on the Record Drawings and reported in writing to the Designer.

D. Active utility lines damaged in the course of the construction operations shall be repaired

or replaced as determined by the Designer without additional cost to the Owner.

1.16 PROTECTION

A. All rules and regulations governing the respective utilities shall be observed by the Contractor in executing all work under this Section. All work shall be executed in such a manner as to prevent any damage to existing buildings, streets, curbs, paving, service utility lines, structures and adjoining property. Monuments and bench marks shall be carefully maintained and, if disturbed or destroyed, replaced as directed.

B. The Contractor shall perform the installation, maintenance and removal of sheet piling, shoring and bracing required for the protection of all items of this contract affected by the work of this Section.

C. The Contractor shall furnish all facilities and materials necessary to prevent the earth at the bottom of excavation from becoming frozen or unsuitable to receive footing or other load bearing units.

1.17 SUBMITTALS

A. Submit certified gradation test data for borrow materials a minimum of one week prior to delivery to the site.

1. Provide 50-pound samples of each borrow material to testing lab for moisture density testing a minimum of one week prior to delivery to site.

B. De-watering Plan (As necessary)

C. Dust Control Plan

PART 2: PRODUCTS

2.01 EARTH EXCAVATION

A. Earth Excavation shall include the excavation of material of every description regardless of the type encountered from within the project limits as shown on the drawings and as directed by the Designer, not paid for under other contract items. This shall include removal and disposal of junk metals, trash, signs, fences, guardrail, concrete, concrete footings, boulders less than 1 cubic yard, bituminous concrete, and debris of every nature.

2.02 ROCK EXCAVATION

A. Rock excavation within proposed work limits shall include all rock materials encountered including all surface boulders and boulder encountered during excavation within the project limits up to 1 cubic yard.

B. Any rock encountered over 1 cubic yard in size (including boulder or ledge) will be paid for as an extra work consideration measured in place by the Owner’s Representative or the Designer. No rock removal will be paid to the Contractor without prior measurement and authorization.

2.03 GRAVEL BORROW

A. Gravel borrow shall be used as a sub-base and for replacement of unsuitable material in the event that acceptable on-site material is unavailable. Gravel borrow shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings, and deleterious materials.

B. Gradation requirements for gravel shall be determined by AASHTO-T11 and T27 and shall conform to the following:

Sieve Designation	Percent Passing
½ inch	50-85
No. 4	40-75
No. 50	8-28
No. 200	0-10

C. Maximum size of stone in gravel shall be 2 inches in largest dimension.

2.04 KNOWN OBSTRUCTIONS

A. These include obstructions that are indicated on the Contract Drawings either explicitly or by reference. The location, configuration, and the nature of the known obstructions may vary from those stated, which shall not affect the applicability of these provisions.

1. None determined.

2.05 CRUSHED STONE

A. Crushed stone shall be used where specified on the construction drawings.

B. Crushed stone shall consist of one or the other of the following materials:

1. Durable crushed rock consisting of angular fragments obtained by breaking and crushing solid or shattered natural rock, and free from a detrimental quantity of thin, flat, elongated, or other objectionable pieces.

2. Durable crushed gravel stone obtained by artificial crushing of gravel boulders or field stone with a minimum diameter, before crushing, of 8 inches.

C. The crushed stone shall have a maximum percentage of wear as determined by AASHTO-T96 and shall be uniformly blended according to the following gradation requirements:

Tabulation of Stone Sizes
Percent by Weight Passing Through

	1 ½”	¾”	½”	¼”
2 ½”				
2”	100			
1 ½”	95-100			
1 ¼”				
1”	35-70	100		
¾”	0-25	90-100		
5/8”			100	

½”	10-50	85-100	100
3/8”	0-20	15-45	85-100
No. 4	0-5	0-15	20-50
No. 8		0-5	0-15
No. 16			0-5

PART 3: EXECUTION

3.01 GENERAL

A. All equipment and methods for excavation shall be adequate and suitable to accomplish the work in a safe and satisfactory manner.

B. Sub-grade at the bottom of excavation shall be undisturbed, or restored at the Contractor's expense. Unauthorized over-excavation shall be replaced with compacted gravel borrow or by extending concrete footings for the extra depth, as approved by the Owner.

C. Suitable excavated material may be used for backfill, fill or embankment. Suitability of materials shall be determined by the Designer. Such use of excavated materials may include stockpiling until needed.

D. All unsuitable material shall be removed from the site as it is excavated. The Contractor shall be wholly responsible for the disposal of such excavated material. Such disposal shall be in strict compliance with all City and State rules, regulations, ordinances and laws that regulate and control its disposal.

E. All excavation shall be performed in the dry.

3.02 UNSUITABLE MATERIAL

A. Wherever, in the opinion of the Designer, the material at or below grade line is unsuitable, it shall be excavated to such additional depths as directed by the Designer, and shall be replaced with common borrow or suitable on-site material to not less than 95 percent of maximum dry density as defined under this section.

B. Removal and replacement of unsuitable material is considered a component of the lump sum price as bid and shall not be compensated separately.

3.03 SEDIMENTATION CONTROL

A. Prior to the commencement of any earthwork, the contractor shall install erosion and sedimentation controls as shown and detailed on the drawings.

B. All sedimentation control measures shall be maintained throughout the project until just prior to final acceptance at which time it will be removed and the areas restored as necessary to the approval of the Designer.

3.04 SUB-GRADE PREPARATION AND PROTECTION

A. Protect open excavations with fencing, warning lights and other suitable safeguards. No open excavation shall be left without proper barriers and other devices necessary for public safety.

B. Comply with local safety regulations or, in the absence thereof, with the provisions of the

Manual of Accident Prevention in Construction of the Associated General Contractors of America, Inc.

C. Frost Protection - Make no excavation to the full depth indicated when freezing temperature may be expected unless the footing or slabs can be poured immediately after the excavation has been completed. Protect the bottoms as excavated from frost, if placing of concrete is delayed, with straw, tarpaulins or temporary heat until footings or slabs poured and backfill is placed.

D. Any ditching required to keep the site free from water during construction is the responsibility of the Contractor.

3.05 PLACEMENT AND COMPACTION

A. Samples and Testing

1. All fill material and its placement shall be subject to quality control testing. A qualified laboratory will be approved by the Owner to perform test on materials. All costs of testing will be paid for by the Contractor. Test results and laboratory recommendations shall be available to the Owner's Representative, Designer and Owner.

2. Provide samples of each fill material from the proposed source of supply including on-site sources. Allow sufficient time for testing and evaluation of results before material is needed. Submit samples from alternate source if required.

3. The Designer will be sole and final judge of suitability of all material.

4. The material shall be compacted to a percent of maximum dry density and optimum water content in accordance with ASTM Test Designation D-1557, and the in-place density in accordance with ASTM D-1557.

5. Tests of material as delivered may be made from time to time. Materials in question may not be used, pending test results. Tests of compacted materials will be made regularly. Remove rejected materials and replace with new, whether in stockpiles or in-place.

6. Cooperate with laboratory in obtaining field samples of in-place materials after compacting. Furnish incidental field labor in connection with these tests.

B. Compaction and Tests

1. The following percentages of maximum dry densities shall be achieved:

<u>Under structures, footings, paved surfaces, other improvements</u>

a.	All fills	95%
b.	Top 12" of sub-grade in cut	95%

2. The contractor shall retain the services of a soils testing laboratory approved by the Designer to perform all soil testing related to the project. A sieve analysis and Modified Proctor test, (ASTM D1557-91) shall be performed for all soil material to be incorporated into the project including, but not limited to, each type of on-site

material, gravel borrow, crushed stone, sand, and dense graded crushed stone. On-site compaction tests shall be performed with a Nuclear Density Gauge or other approved method.

For the purpose of this contract, the contractor shall arrange to have the soils testing laboratory on-site to perform compaction testing a minimum of four times, or more as necessary. Compensation for testing services shall be paid for as part of the lump sum contract price and shall include full payment for; sample collection, transportation of sample to laboratory, laboratory analysis; (sieve analyses, Modified Proctor tests), field density tests and preparation of test result report.

Compaction tests shall be performed as follows:

Minimum Locations	**Quantity of Tests**
All proposed pavement areas	1 per 5,000 SF

C. Placing Fills and Compacting

1. Fill material shall be placed in horizontal layers not exceeding six (6) inches under all pavements. Each layer shall be compacted to the percentage of maximum dry density specified for the particular type of fill and at a water content equal to optimum dry density and optimum water content shall be as specified herein.

2. Where water content of the fill must be adjusted to meet this Specification, the fill shall be thoroughly disced to insure uniform distribution of any water added.

3. Areas to be filled or back filled shall be free of construction debris, refuse, compressible or decayable materials and standing water. Do not place fill when materials or layers below it are frozen.

4. Notify the Designer when excavation is ready for inspection. Filling and backfilling shall not be started until conditions have been approved by the Designer.

5. Before backfilling against curbs or walls, the concrete foundation must be completed and sufficiently aged to attain strength required to resist backfill pressures without damage.

6. In confined areas adjacent to footings, the fill shall be compacted with hand-operated vibration tampers. The maximum lift thickness shall be four (4) inches. The degree of compaction attained shall be equivalent to that attained in the adjacent open areas where heavy rolling equipment is used.

7. After the sub-grade under paved areas has been shaped to line, grade and cross-sections, it shall be rolled with an approved power roller weighting not less than six (6) tons until thoroughly compacted. This operation shall include any reshaping, refilling or wetting required to obtain proper compaction. Any areas that subsequently settle shall be refilled to true sub-grade and properly compacted.

D. Placing Crushed Stone

1. Aggregates, as specified herein above, shall be provided as follows:

a. Crushed Stone around footings, as sub-base under foundations, and as shown on the Drawings as specified.

b. Place materials in six (6) inch maximum layers; fill and compact each layer to ninety-five (95) percent maximum dry density.

3.06 GRADING

A. Do all grading required for the work including shaping, trimming, rolling and finishing of the surface of the finish and/or sub-grades for all surfaces. All ruts shall be eliminated.

1. Grading for finish grades and/or sub-grades for paved areas shall be finished at the required depth below and parallel to the proposed surface within 2" vertical in 10'-0" horizontal tolerance above or below the proposed grade.

2. Grading for sub-grades for lawn areas shall be finished at the required depth below and parallel to the proposed surface within 1" vertical in 10'-0" horizontal tolerance above or below the proposed grade.

B. Do all other cutting, filling and rough grading to the lines and grades indicated on the Drawings. Grade evenly to the finished grades shown on the Drawings. No stone larger than 3" in largest dimension shall be placed in upper 6" of fill. Grading shall be brought to bottom of base course under areas to be paved and within 6" of finished grade under areas to receive topsoil.

C. Complete grading operations after site improvements are constructed, and all materials, rubbish and debris removed from the site. Provide sufficient grade staking to witness correct lines and grades, as determined by the Designer.

D. Where streets or sidewalks within or outside the limit of Contract lines have been excavated in fulfilling the work required under this Contract, the Contractor shall furnish and install all material necessary to bring finish surfaces level with existing adjacent surfaces. All work shall be installed to match the existing conditions in accordance with the governing authority. Notify the proper authorities prior to restoring surfaces outside the limit of Contract line.

END OF SECTION

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SECTION 31 23 19

CONTROL OF WATER

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections apply to this Section.

B. Examine all Drawings and all other sections of the Specifications for requirements therein affecting the work of this Section.

1.02 RELATED SECTIONS

A. Examine all other Sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.

1. Section 03 10 00 – CONCRETE FORMWORK AND ACCESSORIES

2. Section 31 20 00 – EARTHWORK

1.03 SUMMARY OF WORK

A. The work covered by this section includes but is not limited to the following:

1. The control of all surface waters into the work area that will, or have the potential to, interfere or impact on the Contractor’s operations and the successful progression and completion of all work described on the plans and in the specifications.

2. The preparation of a Water Handling Plan for the control of both ground and surface waters within the limits of work.

3. The modification of proposed water control systems as required to suit field conditions. Continuous maintenance, adjustments and improvements to proposed methods and procedures required to control ground and surface waters is required at no additional cost to the contract.

4. Continuous monitoring of weather and water conditions to ensure the proper operation of water handling measures and the protection of workers, equipment, materials and work in progress or completed.

B. The Contractor shall provide temporary surface and/or ground water control measures to prevent such waters from interfering with the Contractor's proposed method(s) of completing required excavations, and work required to complete the improvements shown on the plan, within the specifications and as necessary to complete the work required under this contract. The Contractor is to provide sufficient capacity in the surface and ground water control systems to remove all volumes of water that can be reasonably anticipated, including storm events and storm water that will enter the work area via the existing storm drain system. The Contractor is responsible for the adequacy of the ground and surface water control systems

and/or selecting and operating the ground and surface water control systems to:

1. Provide a substantially dry and stable subgrade for subsequent operations.

2. Avoid damage to adjacent properties, buildings, structures, utilities, workers, equipment and work products.

3. Prevent soil particles and debris from entering the discharge points, by use of filters, sedimentation basins and/or other sedimentation control measures as required.

C. The Contractor shall locate ground water control facilities where they will not interfere with the work to be done under this contract or the work of other contracts.

D. Collection of ground water shall be performed in accordance with all federal and state codes, rules, and regulations.

E. The Contractor shall provide a sufficient number of pumps with adequate capacity at the site and have on hand, at all times, any standby pumps and generators required. The Contractor shall be solely responsible for the control of water and shall provide backup power generation and control components, and devise emergency procedures for maintaining continuous, uninterrupted operations as necessary for the proper and timely completion of the work required of the contract.

1.04 QUALITY ASSURANCE

A. Comply with General and Supplementary Conditions.

1.05 QUALIFICATIONS & SUBMITTALS

A. The Contractor shall prepare a Water Handling Plan required in this specification.

B. The Water Handling Plan shall contain specific information and methods proposed to control surface and ground waters within the limits of work and complete the excavations required within all required areas of the project. The plan shall describe, at a minimum, the following:

1. Arrangements, locations, and depths of the proposed systems and components.

2. A description of equipment and materials to be used and the procedure to be followed in installation, operation, and maintenance in relation to the proposed sequence of excavation.

3. The standby equipment and standby power supply.

4. The proposed locations of discharge points and their relation to sediment control facilities. Also indicate the discharge flow path from each discharge point to the outfall.

5. Locations, sizes, and capacities of sumps and water discharge lines and their relations to water discharge points.

6. Calculations demonstrating adequacy of the proposed system and equipment.

7. Name(s) and address(es) of Subcontractor(s) to be used for work in this Section.

8. Proposed methods of controlling erosion and sedimentation.

9. Points of access to the work areas.

10. Methods and sequence of moving, dewatering and disposing of all excavated soils and sediments.

1.06 PROJECT COORDINATION

A. The Contractor, who shall be solely responsible for the location, arrangement, effectiveness, and depth of all water handling systems, shall choose the methods of controlling storm water and ground water both inside and outside the excavation or systems selected to accomplish the Work. The Contractor shall prepare a Water Handling Plan and submit this plan to the Designer for review at least two weeks prior to the commencement of any construction activities.

B. The Contractor is to fully coordinate all construction activities such that the Water Handling Plan shall be sufficient for all improvements shown on the plans and described in the specifications for this project.

PART 2: PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. The Contractor shall be responsible for providing all materials and equipment required and suitable for the intended purposes and adequate to reliably meet the specified performance requirements.

PART 3: EXECUTION

3.01 CONTROL OF WATER

A. The Contractor is to control the water levels (ground and surface) within all excavations as the Contractor determines best suited to allow for the proper and timely implementation of the construction activities called for on the plans and specifications. The Contractor shall be solely responsible for methods and materials selected to control water, perform required excavations and construct required improvements.

B. Upon completion of construction activities and the need to control water, the Contractor shall remove all water control measures to the satisfaction of the Designer and Owner. All areas disturbed by such removals shall be stabilized and restored in accordance with the intent of the Contract plans or as directed by the Designer and Owner.

C. Nothing within this section of the specifications requiring control of surface and ground waters shall be construed to be in conflict with any other provision of these specifications. It is the Contractor’s responsibility to coordinate all efforts required to complete the construction and implementation of the improvements required under this contract.

D. The Contractor is to keep the Designer advised, in writing, of changes made to accommodate field conditions.

E. The Contractor is to maintain continuous ground water control systems to control ground water seepage into excavations during construction and as required to maintain subgrade intact and allow for the proper installation of all improvements. Pumping may be shut down

for intervals when construction is interrupted, provided that there is a flooding control procedure accepted by the Designer.

G. The Contractor is to divert surface runoff water away from areas being excavated, if such waters will interfere with the Contractor's operations. In such situations, surface water control measures, including dikes, ditches, sumps, cofferdams, and other methods, shall be constructed as necessary to positively prevent flow of surface water into excavations.

H. The Contractor shall be solely responsible for maintaining the effluent quality of water discharged on site and off site from dewatering operations in accordance with discharge permits. At a minimum, all dewatering discharges shall be routed through sedimentation bags or tanks, suitable in size and design to effectively remove suspended sediments from the dewatering discharges. The Contractor shall maintain, for the duration of the contract, all sedimentation control structures, tanks and basins as may be necessary or required by permits and/or the Designer to achieve sediment removal from dewatering discharges. Any stoppage of work due to the nature of the discharged ground or surface waters shall be no cause for the Contractor to request additional compensation or an extension of time to the Contract or other intermediate contract deadline.

END OF SECTION

SECTION 32 11 00

SUBGRADE PREPARATION

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections apply to this Section.

B. Examine all Drawings and all other sections of the Specifications for requirements therein affecting the work of this Section.

1.02 SUMMARY OF WORK

A. Furnish materials, labor, transportation, services, and equipment necessary to perform all sub-grade preparation work as indicated on the Drawings complete as shown and as specified herein.

1.03 RELATED SECTIONS

A. Related sections include the following:

1. Section 03 10 00 – CONCRETE FORMWORK AND ACCESSORIES
2. Section 03 20 00 – CONCRETE REINFORCEMENT
3. Section 03 30 00 – CAST-IN-PLACE CONCRETE
4. Section 31 20 00 – EARTHWORK
5. Section 31 23 19 – CONTROL OF WATER
6. Section 32 12 16 – ASPHALT PAVING
7. Section 32 13 00 – CEMENT CONCRETE PAVING

1.04 SUBMITTALS

A. None Anticipated

1.05 REFERENCES

A. Comply with the current provisions of the following Codes and Standards:

1. ASTM - American Society for Testing and Materials.
2. Standard Specifications
3. Uniform Building Code

PART 2 - MATERIALS

2.01 SUITABLE MATERIALS

A. General: Fill, backfill, and embankment materials shall be suitable selected or processed clean, fine earth, rock, or sand, and free from grass, roots, brush, or other vegetation; contamination; or deleterious material. The size, gradation, and properties of the materials shall be in accordance with the requirements these specifications.

PART 3: EXECUTION

3.01 SUBGRADE PREPARATION

A. Excavate and shape subgrade to line, grade, and cross-section shown on the Drawings.

B. Subgrade is that area on which pavement, surfacing, base, sub-base, or a layer of other material which may be specified, is to be placed.

C. Plow or scarify subgrade to a depth of 6" below the final subgrade elevation; and by harrowing, dry rolling and breaking clods, the earth shall be brought to finely divided condition. Remove boulders, hardened material, or rock encountered. The earth shall be uniform for the full depth and width of the subgrade.

D. Water loose earth to a uniform depth of 4".

E. Harrow the earth to mix the wet earth with the dry beneath, until the whole mass of loose material is at the proper state of moisture for compaction.

F. The finished subgrade, immediately prior to placing subsequent material thereon, shall be in accordance with the plans and specifications.

G. The finished surface of the subgrade, at any point, shall not vary more than 0.05' above or 0.2' below the elevation indicated on the drawings unless approved in writing by Designer.

3.02 BASE

A. Base shall be readily compacted and spread with equipment that will provide a uniform layer conforming to the planned section.

3.03 CLEANUP

A. Upon completion of the subgrade preparation and base, remove surplus construction materials, earth and debris so that the job site is left in a neat and orderly condition.

END OF SECTION

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SECTION 32 12 16

ASPHALT PAVING

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections apply to this Section.

B. Examine all Drawings and all other sections of the Specifications for requirements therein affecting the work of this Section.

1.02 SUMMARY OF WORK

A. The work of this section of the specifications includes furnishing all labor, equipment, plant, tools, and materials, and performing all operations in connection with the proposed full depth asphalt paving required under this contract and all incidental work as specified herein and as shown on the drawings.

B. Perform the following:

1. Replacement of existing paved surfaces removed during the performance of the work.

1.03 RELATED SECTIONS

A. The following sections contain requirements that relate to this section:

1. Section 01 56 16 – DUST CONTROL

1.04 DEFINITIONS

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D8 for definitions of terms.

B. MassDOT: Massachusetts Department of Transportation.

1.05 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

C. Qualification Data: For qualified manufacturer.

D. Material Certificates: For each paving material, from manufacturer.

E. Material Test Reports: For each paving material.

H. Experience history and references for paving subcontractor. Subcontractor shall have a minimum of 5 years of experience and provide a minimum of 3 references.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and prequalified by MassDOT.

B. Pre-installation Conference: Conduct conference at Project site.

C. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:

1. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.

2. Review condition of subgrade and preparatory work.

3. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

4. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Refer to Table 460.42-1 in the Commonwealth of Massachusetts Department of Transportation Standard Specifications, latest edition for temperature limitations.

PART 2: PRODUCTS

2.01 MATERIALS

A. General. All materials shall conform to the requirements of the "The Commonwealth of Massachusetts Highway Department of Transportation (MassDOT), Standard Specifications for Highways and Bridges," 2023 Edition as amended, and as specified herein.

B. Refer to Section 01 56 16 – DUST CONTROL.

C. Hot Mix Asphalt. The intermediate and top courses for hot mix asphalt pavement shall conform to the requirements of subsection 460 and M3.11.00 of the MassDOT Specifications.

1. Job-Mix Formula. The general composition limits of materials shall conform to the following:

a. Top Course: Superpave SSC-9.5. Allowable thickness 1 to 1-1/2 inches.

b. Intermediate Course: Superpave SSC-12.5. Allowable thickness 1-1/2 to 2-1/2” inches.

2. No hot mix asphalt pavement shall be placed until the Designer approves the job mix formula.

E. Tack Coat shall consist of RC-70 cutback asphalt or rapid setting RS-1 emulsified asphalt applied at a rate between .05 and .15 gallons per square yard.

2.02 PAVEMENT MILLING

A. Pavement milling will be in accordance to the subsection 415 of the Commonwealth of Massachusetts Department of Transportation Standard Specifications, latest edition.

PART 3: EXECUTION

1.01 SAW CUTTING OF PAVEMENT

A. Refer to Section 02 14 13 – SELECTIVE DEMOLITION.

1.02 DUST CONTROL

A. General. Dust control shall be applied where required and/or directed by the Owner's Representative and/or Designer. The number and frequency of applications shall be as determined by the Owner's Representative and/or Designer.

B. Treatment. Dust control shall be uniformly applied by approved methods.

1.03 PATCHING

A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Cast-in-place Concrete: Provide continuous concrete along front of new curb to the lines and grades shown on the plans.

C. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

1.04 PAVING

A. Subgrade. All areas designated for full depth reconstruction shall be backfilled and compacted as required under Section 400 of the MassDOT Specifications and Section 31 20 00 Earthwork. The edges of all pavements shall be cut back from exposed edges thereof, a sufficient distance to form a clean, sharp straight edge. The minimum lateral cut back to be allowed will be twelve inches. Cut back pavement shall be carefully removed to minimize any disturbance to foundation materials. The exposed surface of the foundation material shall then be rolled with a power tandem roller, weighing not less than 240 pounds per inch width of tread, wetting the surface as necessary to obtain a firm, even surface. This requirement shall be met in all paving operations. Any depressions or uneven areas shall be regraded and re-rolled until the surface is smooth and satisfactorily compacted.

B. No deviation in required grades more than 1/4" in ten feet. All pavement shall pitch to drain.

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SECTION 32 13 00

CEMENT CONCRETE PAVING

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections apply to this Section.

B. Examine all Drawings and all other sections of the Specifications for requirements therein affecting the work of this Section.

1.02 SUMMARY OF WORK

A. This section specifies materials, equipment, services and accessories to furnish and install cement concrete paving as indicated in on the Drawings and as specified herein.

B. The principal work of this section includes, but is not limited to the following:

1. Cement concrete walks along proposed ramps
2. Cement concrete steps/stairs
3. Cement concrete landings

1.03 RELATED SECTIONS

A. Related Sections including the following:

1. Section 03 30 00 – CAST IN PLACE CONCRETE

2. Section 32 11 00 – SUBGRADE PREPARATION

3. Section 31 20 00 – EARTHWORK

1.04 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace lag, and silica fume.

1.05 SUBMITTALS

A. Product Data: For each type of manufactured materials and product indicated.

B. Design Mixes: For each concrete pavement mix. Include alternative mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

C. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials and aggregates
2. Steel reinforcement and reinforcement accessories
3. Admixtures.
4. Curing Compounds.
5. Applied finish materials.
6. Sealants
7. Bonding agent or adhesive.
8. Joint fillers.

D. Shop Drawings: Submit detailed shop drawings for fabrication, bending and placement of concrete reinforcement.

E. Include special reinforcement required for openings through concrete structures.

F. Laboratory Test Reports: Submit concrete materials test reports and mix design reports certifying that each material or item complies with or exceeds the specified requirements.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer must be certified according to the National Ready Mix Concrete Associations' Plant Certification Program.

C. Source Limitation: Obtain each type or class or cementitious materials of the same brand from the same manufacturer's plant and each aggregate from one source.

D. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by the requirements of the Contract Documents.

PART 2: PRODUCTS

2.01 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves of a radius 100 feet (30.5 m) or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.02 REINFORCEMENT

A. All cement concrete sidewalk and landings will be reinforced with macro-synthetic fiber mesh, conforming to the requirements of ASTM C 1116 Type III Fiber Reinforced Concrete. Fiber mesh will be designed for use in concrete sidewalk applications, and shall be alkali, acid and salt resist, and non-rusting.

B. Epoxy-Coated Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60 (Grade 420), plain steel bars.

2.03 CONCRETE MATERIALS

A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.

B. Refer to Section 03 30 00 – Cast in Place Concrete for additional requirements.

2.04 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.

B. Air-Entraining Admixture: ASTM C 260.

2.05 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

E. Clear Solvent-Borne Liquid-Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

F. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

G. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Evaporation Retarder:

2. Clear Solvent-Borne Liquid-Membrane-Forming Curing Compound

2. Clear Waterborne Membrane-Forming Curing Compound:

2.06 RELATED MATERIALS

A. Expansion- and Isolation-Joint-filler: Expanded polyethylene joint filler and backer rod conforming to ASSHTO-M153 and/or ASTM D1751.

B. Joint Sealant: Sealant shall be in accordance with Federal Specification TT-S-00230C, Type II, Class A and ASTM C920, Type S, Grade NS, Class 25.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces of class and grade to suit requirements, and as follows:

1. Type II, non-load bearing, for bonding freshly mixed concrete to hardened concrete

2. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

3. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Liquid Membrane-Forming Curing Compound: ASTM C309, Type I or I-D, Class A.

F. Chemical Hardener: Hardener shall be a colorless, aqueous solution of zinc or magnesium fluosilicate. Approved proprietary hardeners shall be delivered ready for use in the manufacturer's original containers.

G. Joint filler: Provide mock up on site and submit products of manufacturer for approval by Designer.

2.07 CONCRETE MIXES

A. Prepare design mixes, proportioned according to ACI 2111.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

B. Proportion mixes to provide concrete with the following properties.

1. Compressive Strength (28 Days): 5,000 psi

2. Slump Limit: 3 inches (75mm)

3. Maximum Water-Cementitious Materials Ratio: 0.45.

C. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals.

D. Add air-entraining admixture at manufacturer’s prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus or minus 1.5 percent:

1. Air content: 6.0 percent for 3/4-inch (19-mm) maximum aggregate.

2.08 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.

2.09 FROST WALL INSULATION

A. Provide rigid foam insulation board for frost protection under flush doors.

2.10 CONCRETE SEALER

A. Liquid Penetrant Seal: The work shall include the application of a liquid penetrant/sealer to protect concrete surfaces from chloride intrusion. The material shall meet the requirements of section M 9.15.0 of the Commonwealth of Massachusetts Department of Transportation Standard Specifications for Highway and Bridges and must appear on the most current version of the Qualified Construction Materials List (QCML) for penetrating sealer found at: https://www.mass.gov/qualified-construction-materials-list-qcml

PART 3: EXECUTION

3.01 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.02 FROST WALL PROTECTION

A. Install frost wall protection at all flush doorways.

B. Install to the lines and grades shown on the plans. Frost wall will provide full coverage under doors.

3.03 FIBER MESH REINFORCEMENT

A. All cement concrete sidewalk and handicap ramps will be reinforced with macro-synthetic fiber mesh, conforming to the requirements of ASTM C 1116 Type III Fiber Reinforced Concrete. Fiber mesh will be designed for use in concrete sidewalk applications, and shall be alkali, acid and salt resist, and non-rusting.

B. Application of fiber mesh reinforcement shall be done in accordance with the manufacturer's instructions which shall be submitted to the Engineer 30 days in advance of any work done under these items

3.04 JOINTS

A. General: Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.

1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches (38mm) into concrete.

2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.

3. Provide tie bars at sides of pavement strips where indicated.

4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

5. Use epoxy bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, within walk pavement, and where indicated.

1. Locate expansion joints at intervals of 20 feet (15.25 m), and as shown on drawings.

2. Extend joint fillers full width and depth of joint.

3. Terminate joint filler not less than 1/2 inch (12mm) or more than 1 inch (25mm) below finished surface.

4. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.

5. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

6. Install backer rod and sealant as per manufacturer’s recommendation.

D. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

E. Contraction Joints: Provide weakened-plane contraction joints, sectioning concrete into areas as indicated below unless shown otherwise on Drawings. Construct contraction joints for a depth equal to at least 1/3 of the concrete thickness, as follows:

1. Tooled Joints: Form contraction joints in fresh concrete by grooving and finishing each edge of joint with a radiused jointer tool to the following radius:

a. Radius: 1/4 inch (6mm)

b. Repeat grooving of contraction joints after applying surface finishes as necessary.

2. Sawn Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into hardened concrete when cutting action will not tear, abrade, or otherwise damage surface and before development of random contraction cracks.

3. Inserts: Form contraction joints by inserting pre-molded plastic, hardboard, or fiberboard strips into fresh concrete until top surface of strip is flush with paving surface. Radius each joint edge with a jointer tool. Carefully remove strips or caps of two-piece assemblies after concrete has hardened. Clean groove of loose debris.

4. Spacing: Locate contraction joints at 10-ft max. intervals, each way in concrete pavement; 5-ft max. intervals, each way in concrete sidewalks/patios unless shown otherwise. Locate contraction joints in sidewalks less than 8-ft in width at 5-ft intervals across the walk. Locate contraction joints in sidewalks of 8-ft and greater width at 5-ft intervals across the walk and equally section the walk lengthwise with joints at 5-ft. max. intervals (example: an 8-ft wide walk shall have contraction joints at 5-ft. spacing across the walk and one joint dividing the walk lengthwise into two, equal 4-ft sections.)

3.05 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.

D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery, at Project site, or during placement.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

H. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

1. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer or use bonding agent if approved by Owner's representative.

I. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.

J. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

Cold-weather Placement: Comply with ACI 306.1.

Hot-Weather Placement: Place concrete according to recommendations in ACI 305R.

3.06 CONCRETE FINISHING

A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

2. Magnesium steel trowel finish.

C. Final Tooling: Tool edges of paving, gutters, curbs, and joints formed in fresh concrete with a jointing tool to a radius of ¼-inch unless indicated otherwise on the drawings. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.07 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

a. Water

b. Continuous water-fog spray.

c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300 mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover materials and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.08 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch (6 mm)

2. Thickness: Plus 3/8 inch (9 mm), minus 1/4 inch (6 mm)

3. Surface: Gap below 10-foot- (3 m-) long, unleveled straightedge not to exceed 1/4 inch (6 mm).

4. Lateral Alignment and spacing of Tie Bars and Dowels: 1 inch (25 mm)

5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm)

6. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm)

7. Joint Spacing: 3 inches (75 mm)

8. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus

9. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.09 REPAIRS AND PROTECTION

A. Provide surveillance to protect concrete work from vandalism. Defaced panels will be rejected. Provide watchman police details if needed and schedule work as required until panels have cured sufficiently to prevent defacement.

B. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.

C. Drill test cores where directed by Owner's representative when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

D. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

E. Maintain concrete pavement free of stains, discoloration, dire, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

3.10 LIQUID PENETRANT SEALER

A. Application of the penetrant/sealer shall be done in accordance with the manufacturer's instructions which shall be submitted to the Designer 30 days in advance of any work done under these items. Unless otherwise allowed by the manufacturer's instructions all concrete shall be fully cured, clean, dry, and have no chemical films or coatings applied before application of the penetrant/sealer.

END OF SECTION